

WHAT IS CLAIMED IS:

1 **1.** In an aircraft including an aircraft fuselage, and a vacuum
2 toilet system installed in said fuselage, said vacuum
3 toilet system including a toilet having a toilet bowl, a
4 waste collection tank having an internal pressure below an
5 air pressure prevailing in said toilet bowl, a waste valve
6 connected to an outlet of said toilet bowl, and a waste
7 pipe connecting said waste valve to said waste collection
8 tank;

9 an improvement in said vacuum toilet system, wherein
10 said vacuum toilet system does not include a flushing
11 liquid storage tank, does not include a flushing liquid
12 supply pipe, does not include a flushing liquid nozzle for
13 directing a flushing liquid into said toilet bowl, and
14 expressly excludes all means of supplying a flushing liquid
15 into said toilet bowl.

1 **2.** The toilet system in the aircraft according to claim 1,
2 further comprising an air jet arrangement arranged and
3 adapted to direct an airstream downwardly along an interior
4 surface of said toilet bowl toward said outlet.

1 **3.** The toilet system in the aircraft according to claim 2,
2 wherein said toilet further includes a shroud surrounding
3 and enclosing said toilet bowl, and said air jet
4 arrangement comprises an annular air gap formed between an
5 upper rim of said toilet bowl and an air-guiding flange rim

6 of said shroud that extends radially inwardly over said
7 upper rim of said toilet bowl and downwardly into said
8 toilet bowl spaced radially inwardly from said upper rim,
9 whereby said annular air gap directs said airstream as a
10 sheet of air downwardly along said interior surface of said
11 toilet bowl toward said outlet.

1 4. The toilet system in the aircraft according to claim 3,
2 wherein said shroud encloses an air plenum therein, and
3 said air plenum communicates with said annular air gap.

1 5. The toilet system in the aircraft according to claim 4,
2 wherein said toilet further comprises a toilet lid adapted
3 to selectively close and open a top opening of said toilet
4 bowl, and wherein said shroud further has an air inlet
5 through which air is passively drawn into said air plenum
6 and from said air plenum through said annular air gap into
7 said toilet bowl and from said outlet of said toilet bowl
8 through said waste valve and said waste pipe to said waste
9 collection tank by said internal pressure in said waste
10 collection tank being below said air pressure prevailing in
11 said toilet bowl when said waste valve is opened and said
12 toilet lid is closed.

1 6. The toilet system in the aircraft according to claim 4,
2 further comprising a pressurized or driven air source
3 connected to said air plenum.

1 7. The toilet system in the aircraft according to claim 2,
2 wherein said air jet arrangement comprises an air nozzle
3 arrangement configured and arranged so as to direct said
4 airstream as a sheet of air downwardly along said interior
5 surface of said toilet bowl toward said outlet.

1 8. The toilet system in the aircraft according to claim 7,
2 wherein said air nozzle arrangement comprises an annular
3 air gap extending continuously around an inner side of an
4 upper rim of said toilet bowl.

1 9. The toilet system in the aircraft according to claim 2,
2 wherein said toilet bowl comprises a structural substrate
3 and a nanocoating provided on said structural substrate to
4 form said interior surface of said toilet bowl, wherein
5 said nanocoating is a thin film that has a thickness in a
6 nanometer range.

1 10. The toilet system in the aircraft according to claim 9,
2 wherein said thickness of said thin film is less than 10
3 nanometers, and said thin film is highly ordered on a
4 nano-scale as formed by a nanotechnology process.

1 11. The toilet system in the aircraft according to claim 1,
2 wherein said toilet bowl comprises a structural substrate
3 and a nanocoating provided on said structural substrate to
4 form an interior surface of said toilet bowl, wherein said

5 nanocoating is a thin film that has a thickness in a
6 nanometer range.

1 **12.** The toilet system in the aircraft according to claim 11,
2 wherein said thickness of said thin film is less than 10
3 nanometers, and said thin film is highly ordered on a
4 nano-scale as formed by a nanotechnology process.

1 **13.** A toilet system for collecting waste material including at
2 least one of urine and feces, said system comprising:

3 a toilet bowl with a bowl outlet and a first
4 waste-contacting surface adapted to come into contact with
5 the waste material;

6 a waste discharge arrangement that is adapted to
7 convey the waste material from said toilet bowl, and that
8 includes a waste pipe connected to said bowl outlet and
9 adapted to convey the waste material therethrough, a waste
10 collection tank connected to said bowl outlet by said waste
11 pipe and adapted to receive and collect the waste material
12 therein, and a waste suction valve connected and interposed
13 in said waste pipe between said bowl outlet and said waste
14 collection tank, wherein at least one of said waste pipe,
15 said waste-collection tank and said waste suction valve has
16 a second waste-contacting surface adapted to come into
17 contact with the waste material; and

18 a suction source connected to said waste discharge
19 arrangement and adapted to induce a suction airflow that
20 flows into said toilet bowl from an outside space outside

21 of said toilet bowl, flows along said first
22 waste-contacting surface, and flows out of said toilet bowl
23 through said suction valve when said suction valve is open,
24 such that said suction airflow assists in removing the
25 waste material from said toilet bowl;

26 wherein at least one of said toilet bowl and said
27 waste discharge arrangement comprises a structural
28 substrate and a nanocoating disposed directly or indirectly
29 on said structural substrate so that said nanocoating forms
30 at least one of said first waste-contacting surface and
31 said second waste-contacting surface; and

32 expressly excluding all means of supplying a flushing
33 liquid into said toilet bowl.

1 **14.** The toilet system according to claim 13, further comprising
2 an air jet arrangement that communicates from the outside
3 space outside of said toilet bowl into said toilet bowl and
4 that is arranged and adapted to direct an airstream along
5 said first waste-contacting surface.

1 **15.** The toilet system according to claim 14, further comprising
2 a shroud surrounding said toilet bowl and enclosing said
3 outside space as an air plenum space inside said shroud,
4 and a toilet lid adapted to selectively close and open a
5 top opening of said toilet bowl, wherein said air jet
6 arrangement includes at least one air nozzle that
7 communicates from said air plenum space into said toilet

8 bowl and that is oriented to direct the airstream along
9 said first waste-contacting surface.

1 **16.** The toilet system according to claim 15, wherein said at
2 least one air nozzle comprises an annular air gap extending
3 around an inner side of an upper rim of said toilet bowl.

1 **17.** The toilet system according to claim 15, arranged and
2 adapted so that the suction airflow through said suction
3 valve sucks the airstream from the air plenum space through
4 said at least one air nozzle into said toilet bowl.

1 **18.** The toilet system according to claim 13, wherein at least
2 one of said waste pipe, said waste valve and said waste
3 collection tank comprises said structural substrate and
4 said nanocoating.

1 **19.** The toilet system according to claim 13, wherein said
2 toilet bowl comprises said structural substrate and said
3 nanocoating, and wherein said first waste-contacting
4 surface is at least a portion of an inner bowl surface of
5 said toilet bowl.

1 **20.** The toilet system according to claim 13, wherein said
2 nanocoating is a thin film having a thickness in a
3 nanometer range, and wherein said thin film has been formed
4 by a nanotechnology process.

1 **21.** The toilet system according to claim 13, wherein said
2 nanocoating has such a character that it provides a wetting
3 angle of 0° to 10° with respect to a droplet of the waste
4 material.

1 **22.** A toilet system for collecting waste material including at
2 least one of feces and urine, comprising:

3 a toilet bowl comprising a bowl structure substrate,
4 a bowl outlet, and a nanocoating that is provided on at
5 least a portion of an inner bowl surface of said bowl
6 structure substrate and that forms a first waste-contacting
7 surface adapted to come into contact with the waste
8 material;

9 a waste discharge arrangement that is adapted to
10 convey the waste material from said toilet bowl, and that
11 includes a waste suction valve connected to said bowl
12 outlet, a waste pipe connected to said waste suction valve
13 and adapted to convey the waste material therethrough, and
14 a waste collection tank connected to said waste pipe and
15 adapted to receive and collect the waste material therein,
16 wherein at least one of said waste pipe, said waste
17 collection tank and said waste suction valve has a second
18 waste-contacting surface adapted to come into contact with
19 the waste material;

20 a suction source connected to said waste discharge
21 arrangement and adapted to induce a suction airflow from
22 said toilet bowl through said suction valve when said
23 suction valve is open, such that said suction airflow

assists in removing the waste material from said toilet bowl; and

air directing means that direct at least a portion of said airflow along said first waste-contacting surface downwardly toward said bowl outlet; and

expressly excluding all means of supplying a flushing liquid into said toilet bowl.

23. A toilet system for collecting waste material including at least one of urine and feces, said system comprising:

a toilet bowl with a bowl outlet and a first waste-contacting surface adapted to come into contact with the waste material;

a toilet lid adapted to selectively close and open a top opening of said toilet bowl;

a waste discharge arrangement that is adapted to convey the waste material from said toilet bowl, and that includes a waste pipe connected to said bowl outlet and adapted to convey the waste material therethrough, a waste collection tank connected to said bowl outlet by said waste pipe and adapted to receive and collect the waste material therein, and a waste suction valve connected and interposed in said waste pipe between said bowl outlet and said waste collection tank, wherein at least one of said waste pipe, said waste collection tank and said waste suction valve has a second waste-contacting surface adapted to come into contact with the waste material;

20 an air jet arrangement that communicates from an
21 outside space outside of said toilet bowl to an interior of
22 said toilet bowl and that includes at least one air nozzle
23 oriented to direct an airstream along said first
24 waste-contacting surface; and

25 a suction source connected to said waste discharge
26 arrangement and adapted to induce a suction airflow, which,
27 when said toilet lid closes said top opening of said toilet
28 bowl, sucks said airstream into said toilet bowl from said
29 outside space through said at least one air nozzle, so that
30 said airstream flows along said first waste-contacting
31 surface and flows out of said toilet bowl through said
32 suction valve when said suction valve is open, such that
33 said airstream assists in removing the waste material from
34 said toilet bowl;

35 wherein at least one of said toilet bowl and said
36 waste discharge arrangement comprises a structural
37 substrate and a nanocoating disposed directly or indirectly
38 on said structural substrate so that said nanocoating forms
39 at least one of said first waste-contacting surface and
40 said second waste-contacting surface; and

41 expressly excluding all means of supplying a flushing
42 liquid into said toilet bowl.

- 1 **24.** The toilet system according to claim 23, wherein said at
2 least one air nozzle comprises an annular air gap extending
3 around an inner side of an upper rim of said toilet bowl.